A DANGER

TO THE

PUBLIC HEALTH.

II.

LOCAL GOVERNMENT JOURNAL.

LONDON.

1894.

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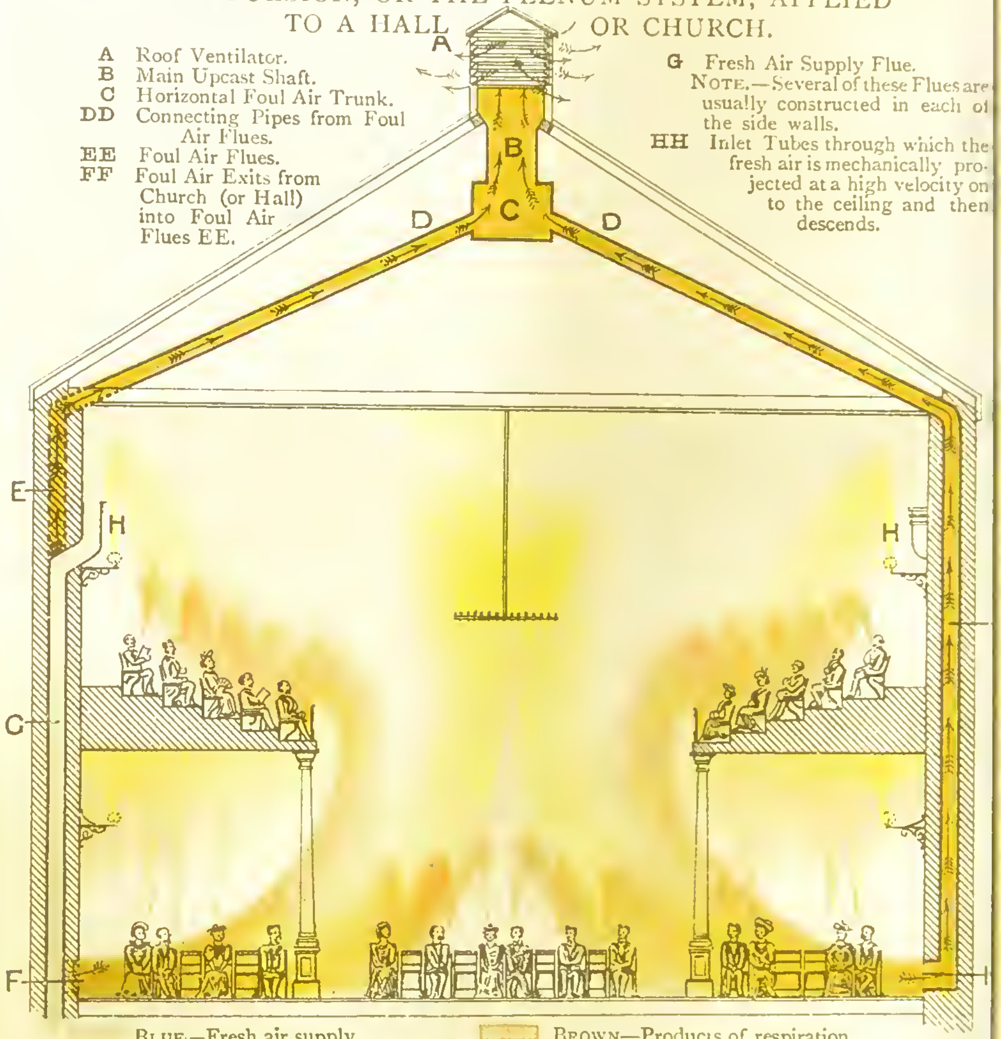
MECHANICAL VENTILATION ON THE DOWN-DRAUGHT PRINCIPLE, BY IMPULSION, OR THE PLENUM SYSTEM, APPLIED TO A HALL OR CHURCH.



A	Roof Ventilator.
B	Main Upcast Shaft.
C	Horizontal Foul Air Trunk.
DD	Connecting Pipes from Foul Air Flues.
EE	Foul Air Flues.
FF	Foul Air Exits from Church (or Hall) into Foul Air Flues EE.
G	Fresh Air Supply Flue.
HH	Inlet Tubes through which the fresh air is mechanically projected at a high velocity on to the ceiling and then descends.

NOTE.—Several of these Flues are usually constructed in each of the side walls.

🟦 BLUE—Fresh air supply.

▨ BROWN—Products of respiration.

🟨 YELLOW—Products of combustion.

🟥 RED—Products of respiration from infected persons.

"In halls arranged with galleries, the difficulty of so arranging downward currents that, on the one hand, the air rendered impure in the galleries shall not contaminate that which is descending to supply the main floor below, and, on the other hand, the supply for the floor shall not be drawn aside to the galleries, is so great that it is almost an impossibility to effect it."—Extract from Government Report to Congress on the failure of mechanical ventilation at the Capitol, Washington, U.S.A.

"The air is delivered by fan propulsion and is taken out at the floor, giving a downward system of ventilation. The air vitiated by respiration is brought back to be reinhaled. . . . M. Trélat emphatically condemns downward ventilation."—Extract from Official Report on the failure of mechanical ventilation at the Chamber of Deputies, Paris.

Reprinted from the BUILDING NEWS, *November 2nd*, 1894.

"'A DANGER TO THE PUBLIC HEALTH.'

" *To the Editor of the* BUILDING NEWS.

" SIR,—The public are deeply indebted to you, and also to the editor of the *Local Government Journal*, for the exposure which has been made of so-called systems of mechanical ventilation by downward currents, and the manner in which the public health is being exploited in the name of sanitary science. Though those who advocate such systems may doubtless have substantial reasons for so doing, that in no way justifies the sacrifice of the public health, or purse, to private interests or prejudices.

" Having lived in America, and taking an interest in the subject, I am fully cognisant of how the mechanical downward system of ventilation by impulsion was 'boomed' there, just as is being done in this country at the present time on a smaller scale.

" These 'combines' did not, however, save the mechanical downward system from being ultimately discarded and condemned (as I observe it has been similarly condemned at the recent congress of the Sanitary Institute) by all but those financially interested in it, and others immediately responsible for the expenditure of the large sums of money incidental to its application. Independent of its being proved on the most unimpeachable testimony to be extremely dangerous to health, the downward system, as shown by the irrefutable data specially compiled by the United States Government (which also strongly condemned this system on every other point), is the most costly form of ventilation in existence, and yielding no equivalent value, but the reverse, for the money expended.

[OVER.

"It is easy to understand that, in this commercial and not over-scrupulous age, a form of ventilation, in the application of which much money is involved, would be operated by promoters in preference to any 'natural' system, out of which, owing to its simplicity, comparatively nothing could be made.

"It is a noticeable feature in connection with the commercial development of these mechanical systems that each inventor (?) or syndicate states, in explanation of the failures of similar systems, that the appliances used were defective and unscientifically applied, but that with *their* system 'all will be well,' generally backing up these statements with a display of tables of analysis of the air and volumes of air supply truly marvellous, but, nevertheless, proved in their turn to be, as with others, something less than valueless. The ignorance of prospective clients of the subject is also relied upon as a chief factor in the successful negotiation of the business. The very timely exposure of this 'system' and the mode of 'working' it (which is nothing short of a public scandal, seeing that the matter is one of life and death) will doubtless have the effect of opening the eyes of at least the intelligent and thinking portion of the English people before they have had to pay so severely through the nose for their experience as our American cousins had to do. It is satisfactory to note from the newspaper reports that this awakening is seemingly already taking place in certain towns—Leeds in particular—where, amongst other matters, it is proposed to experimentally try mechanical ventilation, the Press taking the question up warmly in opposition, and meetings of the ratepayers held to protest against such unwarrantable waste of the public monies.—I am, &c., PUBLIC HEALTH.

"Broadstairs, Oct. 29."

A DANGER
TO THE
PUBLIC HEALTH.—II.

Reprinted from the

LOCAL GOVERNMENT JOURNAL,

OCTOBER 13TH, 1894.

"A SANITARY contemporary, criticising the recently-published report on the failure of the mechanical ventilation of the Houses of Parliament, says:—

"'The most conspicuous instance of almost boundless expenditure, resulting in little or no satisfaction, is that afforded by the prolonged efforts to properly ventilate and warm the Houses of Parliament.

"LAMENTABLE FAILURES."

"'There have been so many lamentable failures brought before the notice of the public, that it is not in the least surprising that they imagine that the subject is a difficult one. For example, after a few hours' stay in our new Law Courts, people conclude that it would be much better to rely upon the open fireplace for warming, and an open window for ventilation, than upon the elaborate system employed [mechanical ventilation by impulsion], which sends them away with aching heads, cold feet, and a general feeling of *malaise*.'

"The following extracts from the report in question are instructive:—

REPORT ON THE VENTILATION OF THE HOUSES OF PARLIAMENT.

"'There is no doubt that a state of matters, very far indeed removed from ideal ventilation, exists at present in the Houses of Parliament, and more especially in the House of Commons.

"'It is probable that casual observers who have had the warming and ventilating arrangements explained to them, and who have been further informed of the great body of air that is continually being passed through the various sections, would naturally be impressed with the apparent completeness of the whole arrangements. Theoretically, no doubt, the present system of warming and ventilating seems satisfactory.'

TABLES OF AIR ANALYSES AND SUPPLY FALLACIOUS.

"When one considers the enormous volume of air, equal to ten times the cubic contents of the House of Commons, which is passed through it every hour, also that the elaborate tables of air analysis are apparently all that could be desired, and yet the ventilation is so notoriously bad, it is clear that there is something very radically wrong with mechanical ventilation by impulsion, and that tables of analysis and of volumes of air passed through a building are not to be accepted as correctly indicating either the general purity of the air, or the efficiency of the ventilation.

"'In summer the incoming air is cleansed and cooled before being admitted into the chambers, in winter the fresh air is warmed.'

"The air is also passed through an 'ingeniously constructed screen arrangement' to free it from fog and other impurities, which it is said to effect in a most efficient and satisfactory manner.

AIR SCREENS MOST EFFECTIVE WITH NATURAL VENTILATION.

"There are many different contrivances in use for washing, screening, and purifying the air, the majority of which seem to answer the purpose, though the evidence indicates that they are found to be most efficient when employed in conjunction with a natural system of ventilation where the air is not mechanically propelled, but is drawn through by extraction, owing to the air being more thoroughly purified passing in at a low velocity than when forced in under pressure.

"In the House of Commons the fresh air is blown in under pressure by a powerful fan, on what is called the 'Plenum' or impulsion principle, the vitiated air passing downwards into the bases of heated upcast shafts, through which it finds an exit.

UNEQUAL DISTRIBUTION AND DIFFUSION.

"'The House of Commons being supplied with fresh air, by a separate and definite Plenum system, the additional ventilation necessary in summer is only obtained by blowing in more air by the propeller; more pressure is thus put on the atmosphere inside the chamber, with the result that the bad effects arising from the unequal distribution and diffusion of air blown in are intensified.'

"The ventilation of the House of Lords, though not all that could be desired, is pronounced to be much superior to that of the House of Commons, there being ‘no Plenum arrangement or blowing in of the fresh air under pressure, the air being drawn in by extraction only.’

SUPERIORITY OF NATURAL VENTILATION.

“Throughout the other parts of the building no alterations are deemed necessary, owing to ‘the incoming air being admitted quite *naturally* to the greater portion.’

“This is certainly, coming from such an authority, a high tribute to the superiority of natural ventilation.

“In a supplementary statement published in the columns of *The Builder*, the expert further adds to his report:—

EXTRACTION BETTER THAN PROPULSION.

“‘Considering that the House of Lords is admittedly so much better ventilated by extraction alone, and that the air passing in is, if anything, fresher, being also cleansed and warmed and cooled, and given the necessary humidity, &c., and handled as desired, without any fan propulsion, but by extraction pure and simple, I think it may be taken for granted that extraction, rightly applied, is infinitely better all round than propulsion.

PROPULSION A FAILURE.

"'I never yet knew of a system of propulsion, pure and simple, that effected an efficient and satisfactory ventilation of any large building. In the case of the House of Commons there is no lack of *fresh* air sent in, or that can be sent in; the trouble is rather to get rid of *all* the vitiated air, and that can only be done effectively by a proper system of extraction, by which the vitiated atmosphere would be drawn out from various points.'

"This opinion as to extraction at the higher parts of a building, as recommended in the report, being the most effectual method of getting rid of the vitiated air, is supported by all the leading authorities, including Sir Douglas Galton, F.R.S., President of the Sanitary Institute. The views of Lord Kelvin, President of the Royal Society, on the efficiency of automatic extraction are well known, as are also those of Sir Benjamin Ward Richardson, F.R.S., first President of the Sanitary Institute, who emphatically declares a natural system of ventilation to be superior to all other methods.

"NOTORIOUSLY BADLY VENTILATED."

"The expert enunciates the opinion that 'So long as architects employ the Plenum system or propulsion pure and simple, colossal buildings like the Houses of Parliament, the London Law Courts, the National Liberal Club, &c., will continue to be notoriously badly ventilated in every sense of the term.

"'Ventilation is a science—quite distinct from that of architecture—and it really requires almost the close study of a lifetime to master properly all its intricacies. It is unreasonable, therefore, to expect architects to be experts in heating and ventilation; and my lengthened experience in different parts of the world goes to show that the better class of architects never profess to have any special knowledge in this direction.' (These remarks, we opine, are even more applicable to committees than to architects.)

ENORMOUS VOLUMES OF AIR: NOT VENTILATION.

"'This trouble of inefficient ventilation in large legislative buildings—notwithstanding the enormous amount of fresh air that can be passed through them sometimes "without ventilating them"—is not at all confined to the Houses of Parliament in this country.

" 'For many years the heating and ventilating installation at the Capitol in Washington was the greatest example of "propulsion pure and simple" in the whole world. Two large fans were used for forcing in air under pressure on the Plenum system. After years of experience, however, it was found absolutely necessary to adopt extraction [from the ceiling] as well, in order to ensure the certainty of the vitiated air being got rid of under all states of the atmosphere.

EVIDENCE OF THE SURVEYOR TO HER MAJESTY'S OFFICE OF WORKS.

" 'The London Law Courts were, I presume, the greatest example in this country of "propulsion pure and simple" in ventilation, and there, again, we find, from the evidence of the Surveyor to Her Majesty's Office of Works, given in the 1891 report of the Select Committee of the House of Commons on Ventilation, that, before long, extraction [from the ceiling] had to be resorted to, in combination with the Plenum system, in order to make the ventilation anything like tolerable and bearable.'

"*The Building News* says 'notorious examples of the failure of mechanical ventilation by impulsion, or artificially forcing air into a building, are the new London Law Courts and the Houses of Parliament, where mechanical arrangements are employed; and all that money and the highest scientific and engineering skill could do to make the ventilation satisfactory has been tried, but without success.

MECHANICAL VENTILATION DESTRUCTIVE OF DIFFUSION.

" 'Mechanical ventilation by impulsion forces air into a building under pressure and at a high velocity—destructive of diffusion—causing disagreeable and dangerous draughts in the vicinity, and in the line of the inlets and outlets, the other parts of the building being left wholly unventilated, as the incoming columns of air usually travel, or are propelled, in a direct line to the nearest outlet, and there make their escape. Engine-driving columns of air through a building is not ventilating it. It is a well-known fact that those employed in public buildings mechanically ventilated by impulsion constantly complain of feeling ill, and are frequently incapacitated from fulfilling their duties.'

THE PROPULSION FAN CONDEMNED.

" *The Builder*, in an editorial on the ventilation of the Houses of Parliament, expresses very decided opinions as to the causes of the failure, the use of the propulsion fan being condemned as one of the chief. 'The evidence,' says *The Builder*, 'that the ventilation is not equally good in all parts of the House seems unquestionable, and the reason for it, as hinted just now, is shown to be connected with the modification of the original system of inward ventilation all over the floor, coupled with the use of the propulsion fan. When the system was an extract only, and the admission was through the dusty carpet over the whole area of the floor, it is probable that the ventilation, however unsatisfactory in other respects, was more evenly diffused than at present.

PROPULSION FANS "MILITATE AGAINST" VENTILATION.

"'Thus the very means employed to assist the propulsion of fresh air into the House militate against its effectual service in purifying the atmosphere.

"'In fact, it is expressly stated that in the House of Lords, which is ventilated only by extraction, the fresh air is much more evenly distributed, and there are not the same complaints as in the House of Commons.'

"The opinions of *The Builder* are fully borne out by the reports respecting the defective ventilation of other public buildings, where propulsion fans are employed, and confirm the evidence as to the superiority of extraction from the ceiling, as demonstrated in the House of Lords, and the worse than uselessness of propulsion fans.

"'The House of Commons has been,' continues *The Builder*, 'the field of various successive experiments on a large scale, each of which in turn was supposed would completely succeed in rendering the legislative chambers places of pure air.'

"DISASTROUS FAILURES."

"They all, however, proved disastrous failures, in spite of the sanguine predictions of their devisers, especially the latest plan, when propulsion fans were employed, the last state being worse than the first, and condemned by (according to *The Builder*) 'the collective experience of those who sit in these chambers, more particularly those who occupy the House of Commons.' *The Builder* further asserts its 'absolute conviction that the whole existing system of ventilation will have to be rearranged eventually.'

"We are quite of *The Builder's* opinion, experience having demonstrated that mechanical arrangements have completely failed, where used, to fulfil the requirements of ventilation; at the same time we are not prepared to go so far as

The Builder in its advocacy of natural ventilation as expressed in the same editorial, that people 'coddle themselves,' who 'fancy every open window is a danger to health,' or that 'if English people in general would open their windows more freely in all weathers they would have better health,' and would 'be the better for it in the long run.'

"EXTREME VIEWS."

"We fear that such extreme views of the benefits to be derived from natural ventilation in such a form as keeping the windows open *in all weathers* are not likely to commend themselves to many.

"PERFECT SUCCESS" OF NATURAL VENTILATION.

"Referring to an automatic system of ventilation by asperating cowls, *The Builder* states, 'Experiments seem to have demonstrated its perfect success,' and 'we can quite endorse the favourable opinion of it which has been given.'

"Criticising the failure of mechanical ventilation by impulsion at Guy's Hospital, the same journal says:—

"'A portion of Guy's Hospital is interesting to specialists as the seat of the most resolute attempt to introduce artificial ventilation into the wards of a London, if not of an English, general hospital.

. . . . We are sorry to learn that it is said to be condemned unanimously by the medical staff, who find it utterly inefficient, and who regard these wards as the least healthy in the hospital.'

"The wards of this hospital, ventilated with a natural system, are pronounced to be satisfactory.

INEFFICIENCY OF HOT AIR SHAFTS.

"We have before us a large number of official reports on the failure of mechanical ventilation and hot air aspirating shafts in hospitals and other public buildings. It is also stated in these reports that since mechanical arrangements have been replaced by natural ventilation, the results have been most satisfactory. Hot air aspirating shafts, fitted with heating coils, cylinders, &c., seem to have been equally unsuccessful. This form of ventilation is now, however, practically discarded as being 'not in accordance with the views of modern engineers, or with their ordinary practice.'

DOWNWARD VENTILATION UNIVERSALLY CONDEMNED.

"Down-draught ventilation is, however, more universally condemned than any other form of mechanical ventilation by impulsion, and is pronounced by sanitarians to be highly prejudicial to health. The Commission on Ventilation appointed by the United States Government, in the report laid before Congress, after enumerating the disadvantages and dangers of down-draught ventilation, state in Clause 4:—'In halls arranged with galleries, the difficulty of so arranging downward currents that, on the one hand, the air rendered impure in the galleries shall not contaminate that which is descending to supply the main floor below, and, on the other hand, the supply for the floor shall not be drawn aside to the galleries, is so great that it is almost an impossibility to effect it.' Upward ventilation by extraction is the method recommended in the report.

UNJUSTIFIABLE EXPENSE OF MECHANICAL VENTILATION.

"The expense of mechanical downward ventilation is also stated to be *three times greater* than upward ventilation to secure the same purity of air, but that this could only be effected with the downward system at the cost of intolerable and dangerous draughts.

"A leading London architect, writing on the subject, says:—'As it is now generally admitted that mechanical ventilation is not found to be more efficient than ordinary and less expensive methods, the unanswerable objection to its employment is its enormous and unnecessary expense.'"

(*To be continued.*)